TER Electric Actuator Control

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Ametys Code:** N9EE29B
- **Open to exchange students:** Yes

Presentation

Objectives

1) Develop a methodology for designing control architectures for three-phase electric machines: from modeling the machine under study to designing the nested scalar and vector control architecture.
2) Acquire the ability to independently develop an engineering approach to address an electric machine control issue while meeting the requirements of a specification.
3) Design an appropriate control architecture for the machine under study, including voltage control of the converter, a current control loop with controlled performance, a torque control strategy, and even a speed control loop.

Description

Format: The study and research topic (TER) "Control of Electric Actuators" is primarily a TER. Within this framework, an open-ended problem is posed for which there is no single answer. In order to develop students' ability to methodically design an approach to solve this problem, teaching is conducted in a semi-supervised mode. This gives students the opportunity to explore different avenues independently.

Theme: The problem to be solved involves designing a control architecture for simulating an electric actuator (three-phase, synchronous, or asynchronous machine). This design implements a comprehensive approach of progressive complexity aimed at designing each control loop one after the other in an interlocked manner. For each loop, based on a given set of specifications, the first step consists of modeling the behavior of the system to be controlled before moving on to the design of the associated controller based on the "inverse model" principle. The electrical model of the converter-machine system in steady state allows the analysis of operating limits in the torque-speed plane and helps in the development of torque control strategies, which is the final step in the

control architecture. The operating performance obtained for the system as a whole is then quantified and analyzed according to the different design choices for the control loops and the selected torque control strategy.

Pre-requisites

Course “N8EE15C: Converter Control,"
Course “N8EE15D: Machine Control,"
Course “N8EE15F: Design Elements of CVS/Machine Associations"
Course “N9EE29A: Electric Actuator Control Strategy,"